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EXTERNAL VULNERABILITIES AND ECONOMIC INTEGRATION: IS THE UNION OF SOUTH AMERICAN NATIONS A PROMISING PROJECT?

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This study examines the reactions of the Union of South American Nations (UNASUR) economies to external shocks. By using a structural vector autoregression approach, it measures the impact of three external shocks (monetary, commercial, and financial) in the real, monetary, and fiscal economic sectors of seven UNASUR economies, namely Argentina, Bolivia, Brazil, Chile, Colombia, Peru, and Venezuela, and investigates co-movement paths. The results show a non-negligible degree of synchronization across the studied economies, confirming their high external vulnerability. They also suggest that irrespective of size or integration degree, all UNASUR members share mutual weaknesses, which they must fight to overcome.

Keywords: Economic Integration, South America, Structural VAR, UNASUR
JEL classification: C32, E42, F41

1. INTRODUCTION

Economic integration, driven by the motivation to seek macroeconomic stability, seems to be a new global trend. The past two decades have witnessed the formation of several economic unions in Asia, Europe, Africa, and America, including the ASEAN+3 (Association of Southeast Asian Nations together with China, Japan, and Korea) in 1997, the Eurozone in 1999, the Economic and Monetary Community of Central Africa (CEMAC-EMCCA) in 1998, the West African Economic and Monetary Union (UEMOA-WAEMU) in 1994, the Southern African Development Community (SADC) in 1992, the East African Community (EAC) in 2000, and the Union of South American Nations (UNASUR) in 2008. The South American case deserves special attention because, unlike the other blocs above, UNASUR emerged as a political alliance. The

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UNASUR Constitutive Treaty, signed in 2008 and ratified in 2011, formalizes the union as a juridical entity that integrates 12 independent nations in cultural, social, economic, and political fields.[1] Furthermore, UNASUR is conceived as a strategy for improving the socioeconomic conditions of nations that have a common history of economic instability and external dependence.

However, while common concerns and political willingness exist among group members, the question of whether that consensus is sufficient to ensure economic integration remains answered. For instance, economic integration as a strategy for macroeconomic stability seemed to work well in Europe after the euro was launched in 1999 (Sapir, 2011), until the eruption of the European sovereign debt crisis in recent years revealed the inherent weaknesses of an economic union that lacks a political union. This development suggests that the UNASUR project is likely to fail if the concerned economies do not converge economically. Nevertheless, economic and political aspects must go hand in hand for such an integration project to succeed.

This study assesses the UNASUR project from an economic integration perspective. It focuses on how external shocks influence member economies from the viewpoint of one of the motivations for instigating such a collaboration in the first place, namely the reduction of external vulnerabilities. More specifically, this study measures the degree to which three external shocks (i.e., monetary, commercial, and financial) affect the real, monetary, and fiscal economic sectors of seven UNASUR economies (Argentina, Bolivia, Brazil, Chile, Colombia, Peru, and Venezuela) and examines co-movement paths. Moreover, it quantifies the relative importance of external shocks for each studied country and compares the reactions of monetary and fiscal stabilization tools in order to elucidate future challenges for the UNASUR project.

The analysis presented herein proceeds in the following three stages. First, a structural Bayesian vector autoregression (SVAR) model is built for each studied economy and each of the three external shocks. Second, a correlation analysis is performed in order to detect patterns of real, monetary, and fiscal convergence. Finally, information on the forecast error variance decomposition is used to identify the principal sources of vulnerability and to provide comparative measures. The SVAR approach allows researchers to impose identifying restrictions on the relationships between the model's variables, with reference to economic theory (Sims, 1986), and thus ensures a better interpretation of the results. Furthermore, Bayesian estimation techniques avoid misleading results owing to the improper treatment of series with unit roots (Sims, 1988) and provide a robust measure of uncertainty (Sims and Zha, 1999).

The presented analysis extends existing research in three directions. First, this study covers some South American economies rarely considered by previous authors. Despite the fact that researchers have long been intrigued by the impact of shocks and convergence in South America, regional studies have particularly focused on specific

[1] See Arts. 1 and 2 of the UNASUR Constitutive Treaty.

subsets of UNASUR economies, notably MERCOSUR (i.e., Allegret and Sand, 2009a; Busse, Hefeker and Koopmann, 2006; Camarero, Flores and Tamarit, 2006; De Andrade, Falcão-Silva and Trautwein, 2005; Gimet, 2007a,b). Second, this study incorporates three external disturbances in contrast to those works that have mainly concentrated on the effects of exogenous monetary and commercial shocks (Ahmed, 2003; Canova, 2005; Mackowiak, 2007), restricting the study of external financial disturbances to only a few economies (Allegret and Sand, 2009b). Following the recent subprime crisis that originated in the U.S., international financial disturbances have proven to display crucial spillover effects for countries that belong to a group (Gimet, 2011). Third, by including fiscal variables, this study considers the lessons of the current European sovereign debt crisis (Eichengreen, 2012; Issing, 2011), particularly how fiscal adjustments influence integration concerns.

The remainder of this paper is structured as follows. Section 2 describes the modeling strategy and presents the data and variables. Sections 3, 4 and 5 discuss the results and section 6 concludes.

2. EMPIRICAL ANALYSIS

The modeling strategy of using a Bayesian SVAR estimation to determine the impact of external shocks on real economies ensures the reliability of the presented results because of two main aspects. First, the ability to impose identifying restrictions on the relationships between the model's variables (Sims, 1986) ensures a better interpretation of the results. In fact, the SVAR approach has been used extensively in applied macroeconomics in order to counter Sims's criticism (1980) of unidentified VAR models. The SVAR model also allows researchers to capture not only the joint dynamics of multiple time series - as VAR models do - but also the simultaneous interactions between these series, thus constituting a powerful tool to study economic market interactions.

Second, Bayesian inference improves accuracy compared with the so-called "*frequentist*" or "*classical*" methods (see, i.e., Bewley, 2002; Litterman, 1984, 1986; Ribeiro-Ramos, 2003; Sims, 1988). The Bayesian method not only overcomes the over-parameterization problem associated with the estimation of VAR models but also corrects the coefficient bias when time series are non-stationary and provides a reliable measure of uncertainty about estimations.[2] In fact, the Bayesian estimation is unaffected

[2] As a rule, VAR model estimations require a large number of parameters. Some of these parameters are not significant, resulting in multicollinearity and a loss of degrees of freedom, which can lead to inefficient estimates and large out-of-sample forecasting errors. The Bayesian inference shrinks the parameters by using priors, thus reducing the problem of over-parameterization (Doan, Litterman, and Sims, 1983; Litterman, 1980, 1986; Tood, 1984)

by the presence of unit roots (Sims, 1988), which are typically present in economic time series. Hence, it avoids misleading results owing to the improper treatment of non-stationary (or cointegrated) variables and directly identifies the impact of shocks in the path of macro-series when working with level series. Furthermore, the Bayesian technique of inference provides a reliable measure of uncertainty for the estimated models (e.g., Litterman, 1986) and enables us to compute likelihood-based error bands, which have proven to be the best approach to providing error bands in time series models (Sims and Zha, 1999).

2.1. The SVAR Framework

The modeling approach applied in this study assumes that each UNASUR economy can be described by the linear simultaneous *p*'th-order difference-equation model of the form:[3]

$$\begin{aligned} &A_0 x_t = A_1 x_{t-1} + ... + A_p x_{t-p} + \varepsilon_t, \\ &A(L) x_t = \varepsilon_t. \end{aligned} \tag{1}$$

With

$$\varepsilon_t \left| x_s, s < t \sim N(0, I), \right. \tag{2}$$

where x_t is an $n \times 1$ vector of endogenous variables at time *t*, *L* is the lag operator, and p is a finite-order lag length. A_0 is an $n \times n$ matrix that summarizes the contemporaneous relationships between the variables and ε_t is the $n \times 1$ vector of structural disturbances. A_0 is assumed to be non-singular, such that (1) provides a complete description of the conditional distribution of x_t given $x_s, s < t$ and can be solved by multiplying through on the left by A_0^{-1} to produce the reduced form:

$$\begin{aligned} &x_t = B_1 x_{t-1} + ... + B_p x_{t-p} + \mu_t, \\ &B(L) x_t = \mu_t, \end{aligned} \tag{3}$$

in which $B_0 = I$ and μ_t is a white noise that represents the vector of canonical disturbances ($n \times 1$) whose variance-covariance matrix is not restricted (i.e., while still uncorrelated with past x_t, it has a non-diagonal covariance matrix), thus assuming a normal conditional distribution of x_t, $\mu_t \sim iidN(0, \Sigma)$.

[3] This representation corresponds to the parameterization presented by Sims and Zha (1999).

The canonical (μ_t) and structural disturbances (ε_t) are linked by the relationship

$$A_0\mu_t = \varepsilon_t . \tag{4}$$

Thus, Σ is given by

$$E(\mu_t\mu_t') = A_0^{-1}E(\varepsilon_t\varepsilon_t')(A_0^{-1})' = (A_0A_0')^{-1} = \Sigma .$$

Furthermore, the response functions of x_t to structural shocks ε_t for the model are the coefficients in the lag operator $C(L)$ of the infinite-order polynomial representation:

$$x_t = B^{-1}(L)\mu_t = B^{-1}(L)A_0^{-1}\varepsilon_t = C(L)\varepsilon_t .$$

This framework implies that n^2 structural parameters need to be recovered from the reduced form. Because $\sum$ is symmetrical, this recovery is possible only for $n(n+1)/2$ parameters. Thus, the model identification requires the imposition of at least $n(n-1)/2$ restrictions. The short-run constraints are imposed directly on A_0 in (4) and they correspond to certain elements of the matrix set to zero.

Because the purpose of this study is to examine the short-run effects of external disturbances in UNASUR economies, only short-run restrictions are used to identify the SVAR models, as detailed later. Moreover, the parameterization proposed by Sims and Zha (1999) is retained here in order to assert a posterior-integrable function and correctly calculate the likelihood-based error bands. The parameterization of Sims and Zha (1999) corresponds to the following likelihood function:

$$q(B,\sum) = |A_0|^T \exp\left\{\frac{1}{2}tr(A_0A_0'S(\hat{B})) - \frac{1}{2}tr((B-\hat{B})'XX'(B-\hat{B})A_0A_0')\right\},$$

$$\hat{\mu}(t,B) = B(L)x_t ,$$

$$S(B) = \sum_{t=1}^{T}\hat{\mu}(t,B)\hat{\mu}(t,B)' .$$

2.2. Variables and Data

Quarterly data that cover the period from 1993Q1 to 2010Q4 for Argentina, Bolivia,

Brazil, Chile, Colombia, Peru, and Venezuela are used to construct the individual SVAR models.[4,5] In order to measure the impact of external shocks on the real, monetary, and fiscal economic sectors of each country, six domestic variables (two real, two monetary, and two fiscal) and three external variables are selected.

In the model, each studied economy is described by the endogenous variable vector x_t:

$$x_t' = (ext_t, y_t, rer_t, r_t, m_t, def_t, debt_t) .$$

The first variable represents the external factor (ext_t) whose impact on local economies is analyzed. The other six variables capture domestic reactions. The local real economic sector is represented by real GDP (y_t) and the real exchange rate (rer_t) (indirect quotation).[6] The monetary variables are the short-run nominal interest rate (r_t) and money supply M1 (m_t). The inclusion of both interest rates and M1 allows us to capture the monetary policy response of either an inflation- or a monetary-targeting economy. Finally, the public deficit-GDP ratio (def_t) and external public debt-GDP ratio ($debt_t$) are included to account for the fiscal dimension (Bruneau and De Bandt, 2003; Nishigaki, 2009). This variable choice is typical when applying an IS-LM-BP framework (e.g., Gali, 1992) augmented by two fiscal variables, which are included in this case in order to consider the major role of fiscal policy regarding integration concerns, as indicated by the Eurozone crisis (Eichengreen, 2012; Issing, 2011).

To better capture the external vulnerabilities, three external shocks are introduced through the variable ext_t: the U.S. federal funds rate (r_usa_t), the world commodity price index (ext_p_t), and the MSCI index ($msci_t$), which represent the external monetary, commercial, and financial environments, respectively.[7]

First, the inclusion of the monetary dimension through the U.S. federal funds rate is a common approach in previous studies, especially in South America because of its

[4] The data sources are the IMF's International Financial Statistics database, the Inter-American Development Bank, and several national central banks.

[5] The sample is restricted to these seven South American countries because of the availability of reliable data. This sample is representative to the extent that it accounts for 96.6% of total UNASUR GDP, according to the World Economic Outlook Database for April 2012.

[6] Indirect quotation: Units of national currency equivalent to one U.S. dollar.

[7] The Morgan Stanley Capital International (MSCI) world index is a free float-adjusted market capitalization-weighted index that is designed to measure the equity market performance of the following developed markets: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

historical dependence on the United States (Bulmer-Thomas, 2003). However, this trend has recently seemed to be reversing. For instance, some South American countries such as Brazil (Goldfajn and Minella, 2007) are reducing the amount of funds that they borrow from the U.S. and are seeking alternative financing modes, including Chinese investment (Kotschwar, Moran, and Muir, 2012). Nevertheless, despite this changing investment trend, the U.S. federal funds rate remains the most influential source of external monetary disturbances for South America.

Second, because UNASUR countries are commodity-exporting economies, the world commodity price index is included in order to analyze the impact of foreign commercial disturbances (e.g., Jiménez-Rodríguez, Morales-Zumaquero, and Égert, 2010; Makin, 2013). In fact, commodity price disturbances have been proven to significantly influence the real economic sector of commodity exporters (e.g., Collier and Goderis, 2012; Medina, 2010). Moreover, some commodities, notably gold, act as safe havens in times of crises (Roache and Rossi, 2010), which increases the volatility of the income of commodity exporters. It is thus expected that the analyzed economies will be highly vulnerable to fluctuations in commodity prices. Finally, the MSCI world index is typically used in order to proxy for the global financial environment (e.g., Abugri, 2008; Ulku and Ikizlerlic, 2012).

The inclusion not only of monetary and commercial shocks, as is traditional in the literature (e.g., Canova, 2005; Mackowiak, 2007), but also of financial shocks allows this study to go beyond the traditional approach and thereby capture more appropriately the vulnerability to which the studied economies are exposed. Consequently, the corresponding structural disturbances vector is

$$\varepsilon_t' = (\varepsilon_{ext,t}, \varepsilon_{2,t}, \varepsilon_{3,t}, \varepsilon_{4,t}, \varepsilon_{5,t}, \varepsilon_{6,t}, \varepsilon_{7,t}),$$

where ε_{ext} represents the external monetary policy shock, international trade shock, and foreign financial shock. The remaining structural disturbances $\varepsilon_{i,t}$ (for $i = 2,...,7$) do not need to be economically identified, because our focus is on analyzing how external disturbances $\varepsilon_{ext,t}$ affect the dynamics of the domestic variables.

All series are logged, except for r_usa_t, r_t, def_t, and $debt_t$, which are measured in percentage terms. The variables are seasonally adjusted if required. The models are constructed with level series, regardless of the presence of unit roots or cointegration relationships, which is possible thanks to the Bayesian inference. In fact, the utilization of Bayesian techniques enables us to estimate models that are not affected by the presence of unit roots (Sims, 1988; Sims and Uhlig, 1991) and to make direct behavioral interpretations. The traditional information criteria (Akaike, Schwartz, Hanna-Quinn) are used to test for the appropriate lag order. According to these criteria, the series'

dynamics are well described by SVARs(2).[8]

2.3. SVAR Identification: Short-Run Restrictions

The identification of the model requires the imposition of $n(n-1)/2$ restrictions as discussed in section 2.1 (i.e., 21 in this study because seven variables are included). Because of the short-term scope of this study, only contemporaneous restrictions are imposed and the impact of external disturbances on each UNASUR economy is analyzed for a four-year period after the shock (16 periods in total).

The following equation summarizes the identification scheme used, which links the canonical (μ_t) and structural innovations (ε_t):

$$A_0\mu_t = \varepsilon_t,$$

$$\begin{pmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & a_{77} \end{pmatrix} \begin{pmatrix} \mu_{ext,t} \\ \mu_{y,t} \\ \mu_{rer,t} \\ \mu_{r,t} \\ \mu_{m,t} \\ \mu_{def,t} \\ \mu_{debt,t} \end{pmatrix} = \begin{pmatrix} \varepsilon_{ext,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \\ \varepsilon_{5,t} \\ \varepsilon_{6,t} \\ \varepsilon_{7,t} \end{pmatrix}.$$

As only the external shock needs to be identified, the only assumption retained for our purposes is that the studied UNASUR countries are small open economies. Thus, the external variable is exogenous ($a_{12} = a_{13} = a_{14} = a_{15} = a_{16} = a_{17} = 0$) (Gimet, 2011; Mackowiak, 2007). As 21 restrictions are needed to identify the system, a triangular schema (akin to Cholesky) is retained for the matrix of contemporaneous relationships between the variables, A_0. The coefficients are estimated by using Bayesian techniques, and likelihood-based error bands are computed following Sims and Zha (1999).[9] Moreover, alternative identifications of the model were tested to confirm the robustness of the results.[10]

[8] The results of all tests are available upon request.

[9] Sims and Zha's (1999) parameterization assures obtaining a posterior-integrable function, which is necessary for computing impulse responses.

[10] Non-recursive identification schemes for the A_0 matrix do not change the results of interest as long as the exogenous character of the external variable is retained as the assumption ($a_{12} = a_{13} = a_{14} = a_{15} = a_{16} = a_{17} = 0$).

3. RESULTS

The impulse response functions after each external shock are illustrated in Figures 1, 2, and 3, which display the responses of the domestic variables to a variation of one standard deviation in the external variables. The error bands are computed by using the Monte Carlo integration method.[11] A response is considered to be significant if its confidence interval does not include the zero axis. Tables 2, 4, and 5 display the forecast error variance decomposition.

3.1. Impact of a Restrictive U.S. Monetary Policy Shock

Domestic reactions after an external monetary policy shock depend on the exchange rate regime and financial integration of each country. The countries sampled herein can be divided into two groups based on their exchange rate regimes. Argentina, Bolivia, and Venezuela have opted for fixed exchange rate regimes, whereas Brazil, Chile, Colombia, and Peru are so-called FIT (floating inflation targeters) economies (see Table 1). An increase in the external interest rate is expected to be reflected directly in the local interest rates of the first group (Canova, 2005). On the contrary, FIT countries are expected to adjust through the exchange rate channels (Kim and Roubini, 2000). However, these theoretical expectations are not entirely reflected in the results because of the presence of flexible hybrid systems (dirty float) within FIT countries and restrictions on free capital movements within countries that have a fixed exchange rate regime. Chile is the only pure floater, according to the IMF De Facto Classification for 2011; all the other FIT economies are classified as "managed floaters" (Table 1). Moreover, Argentina and Venezuela legally regulate all transactions in foreign currencies, implying that the theoretical assumption of no capital controls is absent.[12]

[11] Specifically, the error bands are computed by using the montesvar.src procedure (Estima-RATS). They correspond to the 0.16% and 0.84% fractiles, namely a confidence interval of 68%. (Sims and Zha 1999).

[12] Argentinean law 19.359 establishes different degrees of constraints for transactions that involve international currency transfers. Likewise, in Venezuela, the Commission for the Administration of Currency Exchange regulates all purchases and sales of foreign currency and administrates the monthly allocation of foreign currency decided by the Central Bank of Venezuela. Moreover, government bonds in dollars are traded through a public system called SITME (Transaction System for Foreign Currency Denominated Securities).

Table 1. UNASUR Exchange Rate Regimes and Monetary Policy Objectives

Country	Exchange Rate Regime	Monetary Policy Objective
Argentina	Crawling Bands	Real Exchange Rate Targeting
Bolivia	Pegged with Horizontal Bands	Monetary Aggregate Target
Brazil	Managed Float	Inflation Targeting since 1999
Chile	Pure Float	Inflation Targeting since 1990
Colombia	Managed Float	Inflation Targeting since 1991
Peru	Managed Float	Inflation Targeting since 2002
Venezuela	Conventional Fixed Peg Arrangement	Nominal Exchange Rate Targeting

The low degree of financial integration in Argentina and Venezuela is confirmed by the Chinn-Ito index.[13] For 2010, this index ranks Venezuela as the most closed economy of the 165 examined countries, while Argentina ranks 106th. By contrast, FIT economies are ranked among the most open. Indeed, Peru tops the index followed by Chile (62nd), Brazil (90th), and Colombia (98th). The high degree of capital account openness of Brazil, Chile, Colombia, and Peru is consistent with their exchange rate regimes (managed or pure float) according to the well-known *impossible trinity*.[14] This trilemma justifies the need for Argentina (currency board) and Venezuela (adjustable peg) to impose capital controls. Bolivia's case is not well defined because even though the country is more open than some FIT countries (it is ranked 89th on the Chinn-Ito index) and its exchange rate regime is fixed, Bolivian monetary policy objectives have never been clearly announced. This degree of discretionary policymaking makes it difficult to anticipate future results.

The exchange rate regimes across UNASUR respond differently to and display diverse degrees of vulnerability after a restrictive monetary policy shock from the United States (Figure 1 and Table 2). Overall, FIT economies seem to stabilize better than countries that have fixed exchange rate regimes (i.e., Argentina, Bolivia, and Venezuela). Indeed, the results presented in Table 2 indicate the lower impact of a U.S. monetary policy shock on the domestic variables of FIT countries.

[13] Two measures of financial integration, namely the volume-based index of Lane and Milesi-Ferreti and the Chinn-Ito index (kaopen), are commonly used in the literature. The Chinn–Ito index was used in the present study because of the availability of updated information for 2010.

[14] The *trilemma* or *impossible trinity* affirms that a country cannot simultaneously have exchange rate stability, monetary independence, and full financial integration. A country must give up one of these goals (Frankel, 1999).

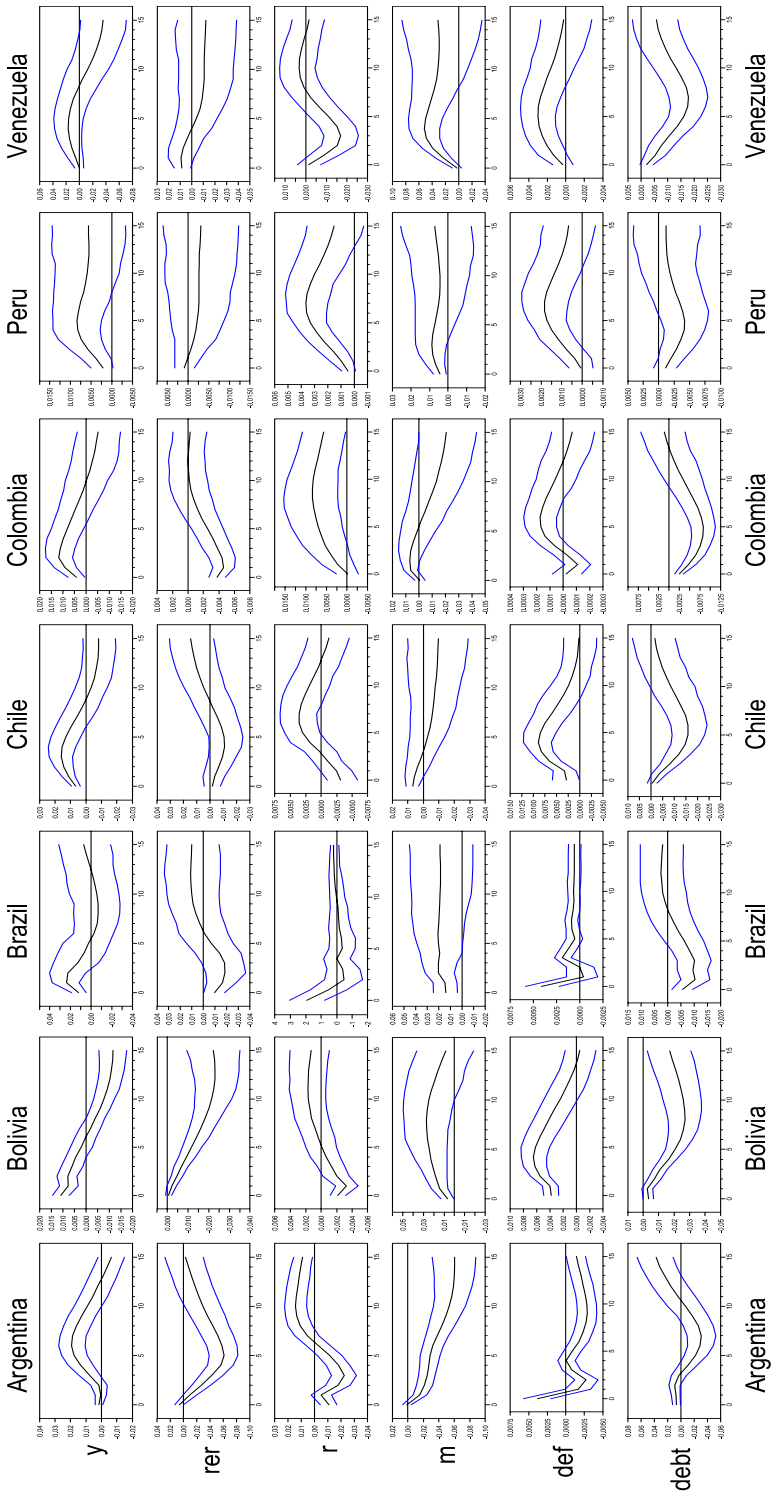

Figure 1. Impulse Response Functions to an Increase in the U.S. Federal Funds Rate

Table 2. Forecast Error Variance Decomposition after an Increase in the U.S. Federal Funds Rate

Country	Horizon	y	rer	r	m	def	debt
Argentina	1	1.35	2.33	4.32	0.95	6.82	2.19
	2	1.62	3.33	4.09	4.72	7.92	3.21
	3	1.78	6.24	7.67	8.75	10.13	3.70
	4	3.27	10.93	11.60	12.51	10.28	3.37
	8	16.83	24.04	14.20	21.84	11.70	7.55
	12	18.87	22.41	18.34	28.92	16.35	8.48
	16	19.27	20.79	20.17	31.15	17.61	13.15
Bolivia	1	11.77	1.16	5.41	2.36	15.54	1.74
	2	12.25	2.21	8.45	5.41	22.58	2.36
	3	13.02	4.25	7.64	6.83	30.92	4.40
	4	12.89	7.26	7.13	8.07	36.72	8.14
	8	12.39	21.45	7.27	10.31	40.20	29.86
	12	16.62	27.18	8.97	10.25	36.01	32.48
	16	20.79	27.03	9.96	9.28	34.61	29.39
Brazil	1	3.80	2.12	3.51	2.72	12.00	2.43
	2	6.22	3.25	3.71	3.53	11.00	6.43
	3	5.76	4.01	4.44	4.62	9.32	7.46
	4	5.12	4.71	4.81	5.14	10.05	8.37
	8	6.15	5.85	5.86	6.19	10.68	8.16
	12	6.97	7.39	6.27	7.14	11.08	9.12
	16	7.47	8.19	6.50	7.84	11.31	9.54
Chile	1	7.16	1.06	2.26	3.48	1.93	0.96
	2	11.79	1.51	3.29	2.95	4.44	2.76
	3	14.33	2.16	3.72	2.76	9.74	6.99
	4	16.14	2.96	4.19	2.88	15.63	12.02
	8	15.46	4.99	7.89	3.98	26.27	24.41
	12	15.08	7.05	8.98	5.02	25.39	24.02
	16	15.93	9.31	9.81	5.79	24.32	22.40
Colombia	1	2.15	18.96	0.86	0.98	0.97	7.61
	2	6.63	20.92	1.47	2.99	2.70	12.56
	3	10.48	21.45	2.29	2.99	3.06	18.57
	4	11.69	20.76	3.42	2.89	3.83	23.66
	8	10.93	17.18	10.15	4.12	7.87	28.06
	12	11.09	16.85	15.73	7.04	8.10	22.48
	16	12.46	16.83	17.88	9.92	9.45	20.24
Peru	1	1.42	1.03	1.35	2.64	0.94	1.32
	2	2.60	1.36	2.10	3.73	1.71	2.25
	3	3.94	1.71	3.72	4.19	3.01	3.52
	4	5.45	2.07	6.56	4.43	4.94	4.98

	8	9.05	3.67	22.52	5.09	13.82	8.53
	12	10.35	5.45	25.63	6.00	16.96	9.46
	16	11.13	6.93	23.88	6.60	17.24	10.22
Venezuela	1	0.92	2.66	0.90	1.00	0.93	1.33
	2	1.36	3.04	3.09	5.42	2.19	2.92
	3	1.92	3.20	6.87	11.08	3.86	5.07
	4	2.56	3.39	10.38	15.68	5.85	8.78
	8	4.17	4.64	13.57	17.82	11.80	28.22
	12	6.77	6.44	14.44	12.99	11.99	31.46
	16	10.45	8.50	14.60	10.43	12.01	29.04

The responses of local interest rates (γ) are particularly interesting. Interest rates decrease contemporaneously in countries that have a fixed exchange rate regime contrary to the expected increase. The short-lived and weak reactions (not more than 5% of the contemporaneous fluctuation explained by the shock - Table 2) indicates the success of rigorously controlling capital flows in order to attenuate vulnerability despite the existence of dollar-pegged regimes. By contrast, the interest rates in FIT countries increase after such a policy shock. Moreover, Peru, the most financially integrated economy according to the Chinn-Ito index, shows the strongest increase in interest rates, whereas the reactions of Brazil and Chile, although positive and significant, are weak and fleeting. Previous studies have attributed Brazilian and Chilean invulnerability to their well-framed and credible monetary policies that allow them to redress issues in the local economy and insulate against external shocks (Mackowiak, 2007). The lack of sensibility in Brazil and Chile can be also ascribed to their positioning in the global economy. Brazil has been classified by the IMF as the largest Latin American economy and one of the five most important emerging countries (BRICS) of the world. Moreover, it accounts for more than 50% of all South American GDP according to the World Bank. Meanwhile, Chile is the most stable economy in the region (Edwards, 2007) and the only South American member of the OECD.

The variables (r and m) accurately reflect the monetary policy tools and strategies used by each country. FIT economies make adjustments through interest rate changes (γ), whereas economies that have a fixed exchange rate regime adjust through the monetary aggregate (m) (Devereux, 2004). Figure 1 shows the significant reaction of γ and non-significant reaction of m and vice versa, suggesting that the monetary policy approach taken by FIT economies is superior. This figure shows that Argentina and Bolivia's real sectors are much more sensitive than those of Brazil, Chile, Colombia, and Peru. Strikingly, Venezuela's real sector does not even react; in this case, the country's closed borders act as a perfect *anti-external shock* shield.

Irrespective of the individual monetary policy strategies pursued by UNASUR countries, an increase in the external interest rate reduces the capacity of domestic economies to finance their budgets. The external public debt-GDP ratio of all countries

decreases after a shock. A higher federal funds rate means a higher U.S. Treasury bonds yield, which, in turn, leads to a higher EMBI (Emerging Markets Bond Index) and therefore a higher cost of borrowing for the studied economies. This phenomenon forces the creation of domestic primary surpluses (*def* increases for all countries after the shock).[15] Considering the precarious capacity of domestic economies to collect taxes, a surplus is likely to be created by a reduction in public spending (Ahmad and Brosio, 2008; Gavin and Perotti, 1997). The Brazilian economy is an exception. As the least indebted country in UNASUR, Brazil's debt and deficit-GDP ratios hardly react to the shock. Further, as the sixth largest economy in the world, Brazil has no problems financing its budget. Peru also seems to have no problems owing to its high level of financial integration. Only 5% of the Peruvian debt-GDP ratio (*debt*) fluctuation is explained by the shock compared with more than 20% for the other countries including Chile. It is worth noting that in this case, Venezuela is not unaffected. In particular, the reduction in Venezuela's debt-GDP ratio (*debt*) is significant (30% explained by the shock). Nevertheless, Venezuela's primary budget (*def*) is not strongly affected and the country's huge oil reserves ensure the continued financing of its public budget.

3.2. Impact of a Positive International Trade Shock

South America has rich natural resources. For instance, Venezuela has the second largest oil reserves in the world,[16] while Chile is a major copper and lithium producer at the global level.[17] Furthermore, Bolivia holds the largest salt flat in the world (i.e., an enormous lithium reserve).[18] Brazil is the world's leading exporter of coffee and Argentina the leading exporter of soy vegetable oil, second largest producer of soy meal, and third largest producer of soybean.[19] Indeed, although the continent's largest economies (i.e., Argentina, Brazil, Chile, and Colombia) have improved their respective industrialization sectors, the production of commodities continues to play a main role. Table 3 shows the exports of the agricultural and fuel & mining sectors as a proportion of total exports for the studied economies. This table shows that more than 50% of the export revenue generated by these economies derives from the aforementioned two sectors, suggesting that they are sensitive to variations in commodity prices. Specifically, a rise in commodity prices typically increases revenues and employment in the concerned production sectors, thereby boosting the real economy (Collier and Goderis,

[15] A positive (negative) value for *def* refers to a primary surplus (primary deficit).

[16] According to data on the proven reserves of crude oil for 2011 from the CIA World Factbook.

[17] In 2010, Chile was the world's leading mined copper producer, accounting for 34% of global production. Moreover, in 2011, Chile held 31% of the world lithium market (U.S. Geological Survey).

[18] According to the U.S. Geological Survey and 2011 Minerals Yearbook.

[19] According to the Food and Agricultural Organization of the United Nations, International Coffee Organization, World Trade Organization, and American Soybean Association.

2012). This reasoning leads us to expect commodity prices to influence real domestic production directly, which is indeed the case (Figure 2). This figure shows that the real output (*y*) of all these countries responds positively and significantly to an increase in commodity prices. Table 4 further demonstrates the high impact of the shock, which explains more than 30% of the variation in real GDP (*y*) in the most sensitive economies.

Table 3. Exports by Sector as a Proportion of the Table for 2010 and the Openness Index Computed from World Trade Organization Data

Sector	Agricultural	Fuel and Mining	Manufacturing	Openness Index
Argentina	0.51	0.12	0.32	0.40
Bolivia	0.17	0.75	0.07	0.76
Brazil	0.34	0.28	0.35	0.23
Chile	0.10	0.64	0.22	0.70
Colombia	0.14	0.58	0.22	0.34
Peru	0.17	0.50	0.11	0.48
Venezuela	0.01	0.95	0.02	0.46

Notes: This table displays data for 2010 from the World Trade Organization. The Openness Index has been computed as the ratio (*exports*+*imports*)/*GDP*.

Table 4. Forecast Error Variance Decomposition after an Increase in Commodity Prices

Country	Horizon	y	rer	r	m	def	debt
Argentina	1	3.98	5.60	1.46	5.55	2.57	0.82
	2	11.00	3.77	3.42	2.89	3.58	1.89
	3	7.78	2.83	5.15	2.95	4.89	2.29
	4	5.76	3.13	5.97	3.41	5.71	2.38
	8	7.40	7.41	9.62	3.55	5.81	4.90
	12	8.18	8.12	9.89	4.317	6.75	6.96
	16	8.12	8.24	9.82	5.16	7.16	6.84
Bolivia	1	24.27	1.12	0.84	14.80	22.94	0.89
	2	36.57	2.28	3.16	28.80	26.91	3.16
	3	37.83	7.45	3.64	35.53	29.29	7.45
	4	36.05	15.63	4.24	38.51	31.14	12.00
	8	29.09	37.81	8.21	37.85	35.02	30.09
	12	26.64	43.61	9.30	34.39	34.18	37.82
	16	26.72	44.50	10.22	29.66	32.72	39.09
Brazil	1	9.37	10.41	1.39	1.32	5.76	5.56
	2	9.62	18.33	2.35	3.94	6.27	7.97
	3	9.87	22.33	3.14	5.42	7.04	15.29

	4	11.21	25.69	3.97	5.83	8.04	24.50
	8	23.07	40.14	5.58	9.34	9.28	45.00
	12	23.47	46.00	6.34	11.87	10.68	49.87
	16	21.91	47.61	6.72	13.30	11.53	50.55
Chile	1	14.70	17.34	5.05	8.81	0.92	2.62
	2	9.27	12.70	4.80	7.09	2.24	2.51
	3	6.39	9.23	5.94	5.57	2.79	2.43
	4	5.58	8.16	6.64	4.87	3.68	2.51
	8	5.07	6.61	6.97	4.55	5.22	3.89
	12	5.61	6.23	6.94	4.62	5.67	4.70
	16	6.17	6.33	6.82	4.68	5.91	5.03
Colombia	1	3.42	34.44	0.90	0.86	2.86	10.15
	2	15.57	23.26	1.25	3.68	4.49	15.74
	3	19.86	17.15	1.82	3.75	5.94	23.53
	4	18.16	17.32	2.71	3.35	7.91	29.12
	8	12.98	18.69	7.84	4.13	9.06	25.81
	12	11.75	18.30	9.43	4.61	8.67	18.06
	16	11.13	18.12	9.55	4.76	8.71	14.45
Peru	1	9.82	9.47	1.10	8.78	2.04	1.10
	2	29.18	13.00	1.57	14.38	5.86	2.91
	3	31.94	12.58	2.62	13.90	15.06	10.83
	4	29.51	11.92	4.84	11.37	27.12	18.12
	8	19.08	10.38	13.99	7.76	44.56	21.93
	12	16.36	10.42	15.41	7.47	41.84	20.51
	16	15.28	10.78	15.08	7.48	39.47	18.87
Venezuela	1	4.69	2.58	4.41	1.6	1.86	0.98
	2	7.91	4.69	8.93	5.24	6.51	1.22
	3	8.25	5.49	12.47	10.61	11.25	1.63
	4	7.55	5.38	14.87	15.37	14.61	2.11
	8	6.49	6.25	15.06	16.77	15.4	5.24
	12	6.49	7.39	14.11	12.31	12.73	7.03
	16	7.08	8.52	13.44	9.54	11.4	7.2

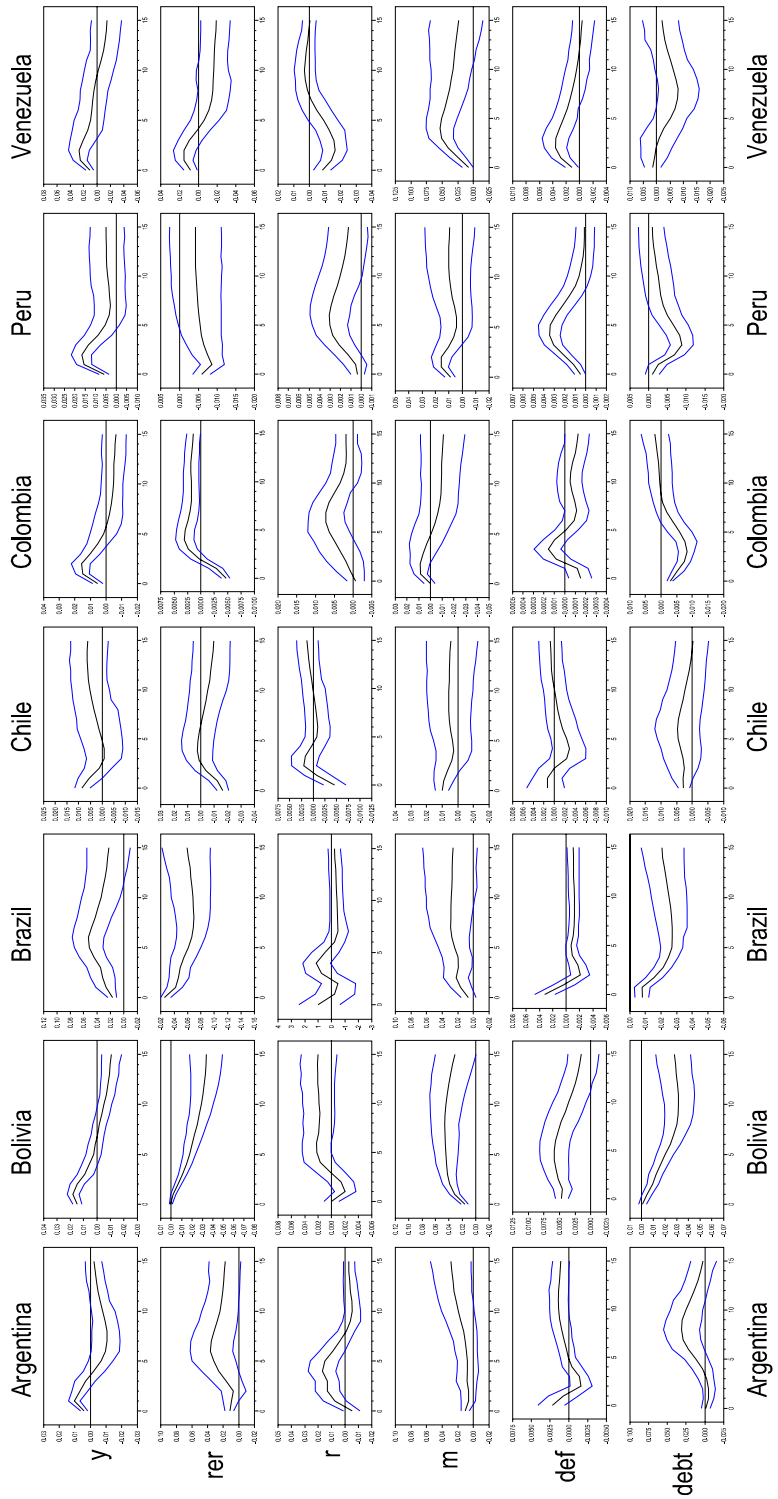

Figure 2. Impulse Response Functions to an Increase in Commodity Prices

These results indicate that the vulnerability of certain countries depends on their degree of openness and specialization. Bolivia is shown to be the most vulnerable country (more than 35% of its real output variation is explained by the shock). Bolivia's low level of industrial exports and the fact that it is the commercially most open country in UNASUR (Table 3) make it the most exposed economy to an external trade shock. Peru and Colombia also react strongly (approximately 30% and 20%, respectively, of their real output fluctuation are caused by the shock) because of the importance of the fuel & mining sector to their economic systems (Table 3). Moreover, Brazil's real output reaction is the most persistent (it disappears 12 periods after the shock), corroborating the relevance of the country's oil and coffee production despite its level of industrialization. By contrast, Argentina, Chile, and Venezuela seem to be less vulnerable; their real sector reactions are short-lived (Figure 2) and barely significant (Table 4). Argentina and Venezuela's strict capital controls could affect their export sectors. Furthermore, Venezuela, as an OPEC member, cannot change its oil production in response to market prices.[20] Chile's case is particularly interesting; the country is the least hit by the shock despite 74% of its export revenue coming from the primary sector; before discovering its enormous lithium reserves, Chile's exports of primary products had been decreasing compared with manufacturing exports.

The increase in output causes an appreciation of the real exchange rate (*rer* decreases) except for Argentina and Venezuela, which control their capital flows and whose output barely responds to the external disturbance, as mentioned above. The Bolivian monetary authorities react by injecting money (*m* rises) in order to defend the parity. Of the FIT economies, Peru and Colombia raise their nominal interest rates to prevent inflation after a boost in their real supply. Similarly, Brazil manipulates the money aggregate in order to offset the *rer* appreciation, confirming the "fear of floating" principle proposed by Calvo and Reinhart (2002).

Additional domestic wealth leads to budgetary surpluses (*def* increases), which reduces the need to acquire more external debt (*debt* decreases). This impact is stronger for the economies that experience the greatest real output improvements, Bolivia and Peru, whose primary surpluses are 35% and 45%, respectively, owing to the impact of the shock (Table 4).

3.3. Impact of a Positive International Financial Shock

An international increase in price assets is expected to affect the real sectors of the economies studied herein for at least three reasons. First, the wealth of domestic equity holders such as firms and households will increase, which, in turn, enhances the volume of production and their ultimate spending levels, growing the real economy. Second, the increase in price assets could affect the balance sheets of domestic banks, resulting in

[20] This is an important point considering that 95% of Venezuelan export revenue comes from oil.

credit expansion and a consequent boost in economic activity. Third, positive global investment could provide incentives for new capital allocations in domestic economic and liquidity surpluses, influencing the ability of banks to extend credit and thus real economic activity. These three effects are closely related to the transmission channels between the financial and real sectors identified in the literature, namely the *borrower balance sheet channel*, *bank balance sheet channel*, and *liquidity channel* (Basel Committee on Banking Supervision, 2011).

Table 5. Forecast Error Variance Decomposition after an Increase in International Asset Prices

Country	Horizon	y	rer	r	m	def	debt
Argentina	1	8.74	1.02	0.80	4.85	4.32	4.67
	2	6.99	2.78	1.94	7.56	5.41	5.94
	3	6.76	2.57	3.24	6.52	5.68	5.04
	4	5.69	2.44	3.67	5.93	5.88	4.70
	8	5.54	2.99	4.68	4.62	6.61	6.26
	12	6.49	4.16	5.54	3.90	6.84	8.99
	16	7.33	5.69	6.09	3.76	7.09	12.65
Bolivia	1	2.40	1.28	0.95	2.27	7.89	0.84
	2	5.11	2.45	4.85	5.41	14.07	1.90
	3	5.01	5.06	8.72	4.56	15.66	4.75
	4	5.35	7.23	10.35	3.97	16.27	9.30
	8	8.50	9.51	9.92	3.69	13.91	16.23
	12	12.30	8.07	9.60	4.53	14.32	13.01
	16	13.24	7.29	9.59	6.20	16.28	12.19
Brazil	1	1.06	11.80	0.82	1.01	3.67	0.76
	2	1.66	13.86	1.76	2.62	10.01	2.11
	3	1.92	12.65	3.14	3.60	10.81	4.50
	4	2.58	10.65	3.85	5.18	10.68	5.57
	8	4.09	8.92	4.85	11.26	10.94	6.16
	12	5.03	8.44	5.10	13.76	11.26	6.30
	16	6.46	8.19	5.21	15.26	11.43	6.49
Chile	1	2.71	18.08	1.46	1.24	3.85	2.50
	2	7.62	22.61	3.07	1.86	11.68	3.86
	3	7.19	21.86	4.28	2.04	16.01	7.95
	4	6.14	19.98	6.51	2.27	18.06	12.78
	8	8.30	15.26	8.81	4.74	16.87	20.04
	12	13.36	17.52	9.29	5.79	16.44	18.62
	16	16.05	21.86	10.95	6.52	16.68	18.04
Colombia	1	0.96	5.98	1.03	1.05	0.9	1.01
	2	2.88	10.93	1.60	1.48	2.69	4.34

	3	3.25	10.21	2.23	1.59	3.11	9.41
	4	3.39	9.16	2.97	1.74	3.62	14.7
	8	4.03	9.82	7.39	2.68	4.42	16.92
	12	5.43	12.00	10.33	4.23	5.46	12.31
	16	7.14	12.65	11.02	5.63	6.83	11.37
Peru	1	4.92	4.11	3.57	11.77	0.83	1.19
	2	11.52	4.97	3.36	18.77	1.49	1.72
	3	14.38	4.89	6.05	17.66	3.75	2.51
	4	14.47	4.78	12.78	15.3	7.82	3.52
	8	11.93	5.40	27.31	10.36	13.50	5.20
	12	11.26	6.08	23.55	9.00	13.17	6.02
	16	10.9	6.59	20.73	8.07	13.26	6.56
Venezuela	1	12.85	2.87	0.86	1.24	0.92	12.64
	2	15.47	2.52	1.50	1.45	1.94	8.28
	3	17.08	2.62	1.95	1.66	2.86	6.42
	4	18.61	2.85	2.61	1.95	3.90	7.68
	8	20.62	4.53	4.96	3.25	6.73	17.39
	12	17.4	6.15	6.91	4.40	7.65	20.22
	16	16.44	7.66	7.87	5.42	8.44	19.32

As shown in Figure 3 and Table 5, a positive international financial shock seems to positively affect the real domestic GDP (*y*) of most UNASUR economies, as expected. However, the boost to the domestic real sector after this external financial improvement is weak and short-lived.

Except for Argentina and Venezuela, which, as mentioned above, restrict capital movements, local real exchange rates appreciate significantly (Figure 3). Approximately 20% of *rer* appreciation is explicated by the shock for the most sensitive economies (Table 5), evidencing capital inflows. However, these new capital allocations are barely translated into economic expansion (the real GDP (*y*) responses are weak and fleeting).

Real exchange rate pressures force local economies to react. Bolivia defends its fixed regime by increasing aggregate money (*m*). Brazil and Peru follow the same strategy in order to avoid a strong appreciation of their domestic currencies -these shocks account for approximately 13% and 14% of the rise in *m*, respectively- confirming the managed float condition. By contrast, the monetary authorities in Colombia, Chile, and Peru (FIT economies) raise their interest rates (*r*) in order to avoid possible inflation rate expectations generated by a higher level of global asset prices. This rise could explain the weak transfer of liquidity excess to the real economy.

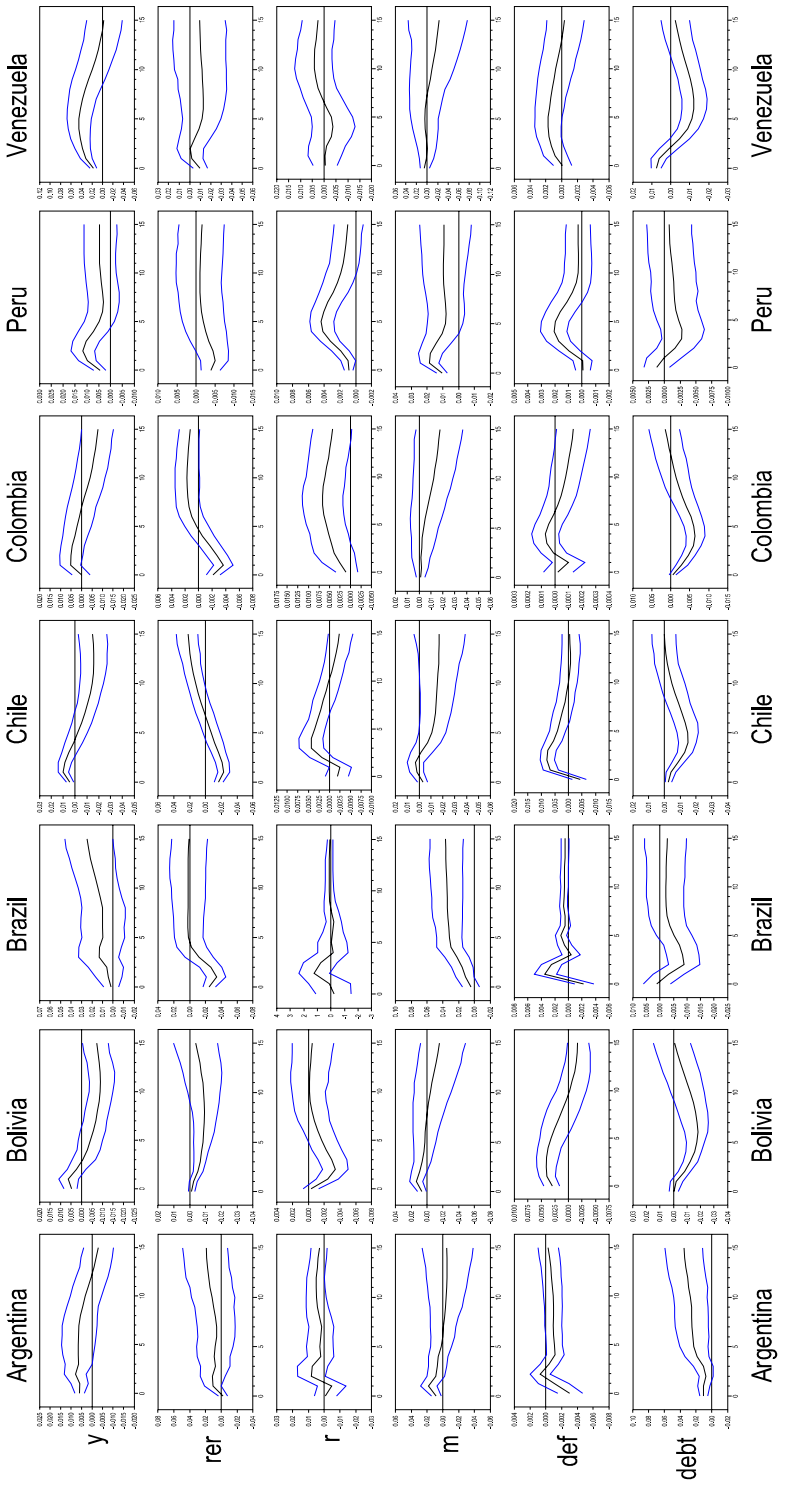

Figure 3. Impulse Response Functions to an International Asset Prices

Argentina and Venezuela's cases are particularly interesting, indicating that capital controls do not necessarily protect the real sector from external financial shocks. As displayed in Figure 3, their real output (*y*) is highly affected despite not experiencing capital inflows. The financial shock accounts for 20% of Venezuela's and 9% of Argentina's real production improvement (Table 5). In this case, the boost to the real economy could be attributed to domestic wealth effects.

Regarding fiscal concerns, the shock significantly reduces the domestic external debt (*debt*) of most UNASUR economies, explaining approximately 20% of the fluctuation in total external debt in the most affected economies and thereby suggesting that the domestic wealth effect reduces the need to acquire new external financing. In fact, Figure 3 indicates that the economies that experience capital inflows (*rer* appreciates) benefit from budget surpluses (*def* contracts) and thereby from less external borrowing. In summary, the studied economies are highly vulnerable to external disturbances. However, it is hard to distinguish common patterns among UNASUR members. Therefore, the next section presents evidence on the coincident reactions to shocks in order to examine the main issue of integration, namely convergence.

4. CO-MOVEMENTS: CORRELATION ANALYSIS

The central aim of any economic integration process is the elimination of disparities between national economies (Sapir 2011). In terms of the South American integration project discussed herein, Article 2 of the UNASUR Constitutive Treaty states that one of the bloc's main objectives is "*... to strengthen democracy and* ***reduce asymmetries*** *within the framework of strengthening the sovereignty and independence of the States.*" However, while the reduction of asymmetries is indeed stated as a goal of UNASUR, summarizing their actual synchronization of members if not straightforward. On the one hand, there are a number of common features such as being commodity producers and vulnerable to external disturbances; on the other hand, the degree of monetary policy independence and financial integration among UNASUR members differs. To shed some light on this issue, a correlation analysis is presented in this section. Using this traditional approach (e.g., Agénor, McDermott, and Prasad, 1999; Gimet, 2007b; Lee and Koh, 2012) will allow us to detect patterns in real (*y* and *rer*), monetary (*r* and *m*), and fiscal (*def* and *debt*) convergence across the seven studied UNASUR members. It is assumed that if the resulting correlation coefficients are positive, the responses are considered to be symmetrical.

Table 6 reports the average unconditional correlation coefficients among Argentina, Bolivia, Brazil, Colombia, Peru, and Venezuela's series for three periods: 1993Q1 to 2010Q4 (whole sample), 1993Q1 to 2008Q3 (the period before the creation of

UNASUR), and 2008Q4 to 2010Q4 (the period thereafter).[21] Table 7 reports the average conditional correlations among the responses of the variables after the three external shocks (i.e., increase in the U.S. federal funds rate, increase in commodity prices, and increase in the MSCI financial index) based on the impulse response functions derived from the SVAR models. The denominations *unconditional* and *conditional* refer to the correlation coefficients among the original series data and among the variables' responses to these three external shocks, respectively.

As shown in Table 6, for the entire sample, real output (*y*) synchronization does not exist within the group of countries, as the average correlation coefficient of real output among the seven economies is only 0.08. However, such a low level is mostly driven by the behavior of the pre-UNASUR series. The fragmentation of the sample shows a pre-UNASUR correlation degree of 0.05 compared with a post-UNASUR degree of 0.43 among real output.

Table 6. Average Unconditional Correlation Coefficients among the Key Macroeconomic Variables

	Real		Monetary		Fiscal	
	y	*rer*	*r*	*m*	*def*	*debt*
Whole Sample	0.08	0.38	0.45	0.96	0.36	0.50
Before UNASUR	0.05	0.41	0.44	0.92	0.40	0.41
After UNASUR	0.43	0.31	0.85	0.71	0.19	0.16

Notes: This table reports the unconditional pairwise correlation coefficients among Argentina, Bolivia, Brazil, Chile, Colombia, Peru and Venezuela's log real output (*y*), log real exchange rate (*rer*), nominal interest rate (*r*), log aggregate money (*m*), public deficit-GDP ratio (*def*), and external public debt-GDP ratio (*debt*). The coefficients are reported as the average of all the possible pairwise combinations between these seven countries.

Second, contrary to the previous case, the fiscal variables (*def* and *debt*) move more similarly before the creation of UNASUR. However, the correlation levels of the deficit-GDP and debt-GDP ratios are considerably high during the whole period (0.36 and 0.5, respectively). Third, despite the diversity of exchange rate regimes and monetary policy decisions of the individual economies, the monetary variables astonishingly co-move among the sampled countries; indeed, the correlation coefficient even reaches 0.96 for the monetary aggregate (*m*) at the whole sample level. However, although these findings offer encouragement that UNASUR members are meeting the goal of the union, the evidence provided by these unconditional correlations in Table 6 cannot be considered to be conclusive.

[21] The UNASUR Constitutive Treaty was signed on September 2008.

For example, the economic environment was contrasting for the seven studied UNASUR countries during the 1990s and 2000s. They were severely affected by the turbulent economic conditions of the 1990s, notably the Mexican crisis (1995) and Asian and Russian crises (1997-1998) (see Frenkel and Rapetti, 2010). By contrast, most of them weathered the 2007-2009 global financial crisis relatively unharmed (Boonman, Kuper, and Jacobs, 2012). While several explanations for this phenomenon have been postulated such as improvements in external balance sheets (Ocampo, 2009) and the development of domestic bond markets (Jara, Moreno, and Tovar, 2009), the undertaking of the South American integration process cannot be neglected as a possible influencing factor.

In order to further investigate the previous global panorama, conditional correlations are presented next in Table 7. The impulse response functions derived from the SVAR models allow us to isolate the effect of the external disturbances in each of the variables for all countries, thereby providing more accurate evidence about the degree of synchronization among the involved countries.

Average correlations, comparable with those of Table 6, are reported in Column (8) of Table 7. This table shows that the reactions to real output (y) after each of the three external shocks (see Panel I) are similar. The synchronization levels of 0.48, 0.25, and 0.30 following an external monetary, trade, and financial shock, respectively noticeably contrast with the overall 0.08 unconditional level presented above, but they are consistent with the level of 0.43 post-UNASUR unconditional level of synchronization. The short-run convergence of real output is thus confirmed in this case.

Nonetheless, the same finding cannot be confirmed for the reactions of the monetary and fiscal variables (see Panels II and III in Table 7). Given that the SVAR framework takes account of the dynamics provided by the differing country-level monetary policy objectives, the correlations among the reactions of the monetary variables to these external shocks are lower than the previous level (0.96). Even though a path cannot be clearly identified because of the negative coefficient of the responses of the monetary variables to the external trade disturbance, the finding of average coefficients above zero (0.17 and 0.18 for r and m, respectively) is a positive, although weak, signal of pro-synchronization behavior. The same finding holds true for the co-movements of the fiscal variables.

Table 7. Average Pairwise Correlations of the Response after these Three External Disturbances

		By Country								By Exch. Rate*		
		AR	*BO*	*BR*	*CH*	*CO*	*PE*	*VE*	*All*	*FITa*	*FITb*	*FX*
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel I. Real Responses												
(*y*)	Mon	0.34	0.57	0.16	0.69	0.68	0.21	0.68	0.48	0.37	0.53	0.59
	Trade	0.40	0.51	-0.21	-0.40	0.53	0.46	0.48	0.25	-0.14	0.05	0.73
	Fin	0.44	0.44	-0.70	0.54	0.55	0.42	0.41	0.30	0.08	0.78	0.63
	Average	0.39	0.51	-0.25	0.28	0.59	0.36	0.52				
(*rer*)	Mon	0.23	-0.14	-0.11	0.07	-0.16	0.01	-0.08	-0.03	0.07	-0.19	0.34
	Trade	0.02	-0.03	-0.17	0.15	-0.01	-0.24	-0.05	-0.05	-0.11	0.45	-0.01
	Fin	0.31	-0.31	0.25	0.38	0.29	0.26	-0.42	0.11	0.90	0.91	0.21
	Average	0.18	-0.16	-0.01	0.20	0.04	0.01	-0.18				
Panel II. Monetary Responses												
(*r*)	Mon	0.47	0.52	-0.33	0.33	0.46	0.35	0.43	0.32	0.12	0.91	0.83
	Trade	0.04	0.24	-0.12	0.00	0.31	0.36	-0.07	0.11	0.10	0.35	-0.14
	Fin	0.26	-0.08	-0.05	0.12	0.3	0.09	-0.03	0.09	0.31	0.66	0.31
	Average	0.26	0.23	-0.16	0.15	0.36	0.27	0.11	0.17			
(*m*)	Mon	0.25	0.15	0.16	0.22	0.45	0.3	0.36	0.27	0.26	0.57	0.14
	Trade	-0.18	0.04	0.01	-0.23	-0.13	-0.02	-0.03	-0.08	-0.06	0.37	0.06
	Fin	0.55	0.58	-0.77	0.55	0.57	0.40	0.49	0.34	-0.02	0.75	0.84
	Average	0.21	0.26	-0.20	0.18	0.29	0.23	0.27	0.18			
Panel III. Fiscal Responses												
(*def*)	Mon	0.07	0.54	0.13	0.56	0.52	0.34	0.51	0.38	0.35	0.73	0.29
	Trade	-0.31	0.18	0.04	-0.31	-0.02	0.09	0.16	-0.03	-0.20	-0.30	-0.18
	Fin	0.19	0.48	0.25	0.64	0.48	0.51	0.59	0.45	0.43	0.70	0.24
	Average	-0.02	0.40	0.14	0.30	0.33	0.31	0.42	0.27			
(*debt*)	Mon	0.65	0.15	0.18	0.72	0.66	0.67	0.63	0.52	0.73	0.91	0.67
	Trade	-0.25	0.01	0.12	-0.20	-0.10	0.05	-0.01	-0.05	-0.10	-0.12	-0.31
	Fin	0.16	0.59	0.49	0.69	0.67	0.62	0.34	0.51	0.75	0.81	0.12
	Average	0.19	0.25	0.26	0.40	0.41	0.44	0.32	0.33			

Notes: * (FITa) Within FIT countries: Brazil, Chile, Colombia, and Peru. (FITb) Within FIT countries excluding Brazil: Chile, Colombia, and Peru. (FX) Within Fixed Regime Economies: Argentina, Bolivia, and Venezuela.

This table reports the correlation coefficients of the real output (*y*), real exchange rate (*rer*), nominal interest rate (*r*), aggregate money (*m*), public deficit-GDP ratio (*def*), and external public debt-GDP ratio (*debt*) reactions among Argentina (*AR*), Bolivia (*BO*), Brazil (*BR*), Chile (*CH*), Colombia (*CO*), Peru (*PE*), and Venezuela (*VE*) after the following three external shocks: i) an increase in the U.S. federal funds rate (Mon), ii) an increase in commodity prices (Trade), and iii) an increase in international asset prices (Fin).

Columns (1) to (7) in Table 7 report the average conditional correlations by country. The coefficients are computed as the average of all the possible pairwise combinations of each country with each of the other sampled UNASUR members. The results show that Brazil is the least synchronized economy; indeed, Brazilian real and monetary responses to external shocks are negatively correlated with those of all other UNASUR members (see Column (3) of Panels I and II in Table 7). To some extent, Brazil's divergent reaction is unsurprising because of its relative economic superiority, as detailed in sections 3.1 and 3.2. What is noteworthy, however, is that Brazilian monetary reactions are negatively correlated even with those of the other FIT countries under analysis (i.e., Chile, Colombia, and Peru). Column (9) in Table 7 reports the degree of similarity between the responses of all FIT countries, while Column (10) excludes Brazil. The exclusion of Brazil from the FIT subgroup significantly changes the resulting average correlation coefficient. For instance, the interest rate's (r) synchronization degree of the reactions of FIT countries to a monetary shock increases from 0.12 to 0.91 (see Columns (9) and (10) of Panel II). Moreover, the correlation coefficient of the monetary aggregate's (m) responses among FIT economies after the trade and financial disturbances passes from negative to positive when Brazil is omitted. According to Moura and de Carvalho (2010)'s findings, Brazil pursues a "tough" monetary policy, whereas Chile, Peru, and Colombia pursue "mild" or "lax" monetary policies against inflation, which might explain Brazil's divergence in this regard. By contrast, the monetary reactions of pegged regime economies (i.e., Argentina, Bolivia, and Venezuela) to external innovations are similar (see Column (11) in Table 7). However, their overall convergent behavior is not as manifest as it was in the previous case. In general, none of the other individual countries shows a divergent reaction path as in the Brazilian case. The evidence that supports similarities in domestic reactions to external shocks is thus strong in the studied UNASUR economies.

Overall, despite the different policies and particular conditions of individual members, the correlation analysis presented above supports the existence of convergent paths within UNASUR's key macroeconomic variables. Nevertheless, the South American integration project is in an embryonic stage, and enormous integration potential remains in the region. For instance, thanks to endogeneity concerns (i.e., post-similarities can emerge within an integrated group even if prior-similarities are not fully manifested), monetary convergence could be easier to achieve in the future if a monetary union were adopted (e.g., Akiba and Iida, 2009; Frankel and Rose, 1998; Rose and Engel, 2002).

5. RELATIVE VULNERABILITIES

Historically, South American countries have been characterized as economic-dependent nations. Over time, these countries have taken a number of measures to change this condition (Bulmer-Thomas, 2003). However, as indicated by the previous

results (Section 3), despite measures designed to increase their economic independence, they are still highly vulnerable to the external environment. This section therefore identifies the principal sources of fragility by comparing the vulnerabilities of the studied countries. In particular, we examine the degree to which these countries are sensitive to financial shocks compared with monetary or trade shocks. This relative sensitivity matters to the extent that individual members seek a better way in which to overcome difficulties through integration. Therefore, it is crucial to analyze which categories of external disturbances (monetary, commercial, or financial) most affect these countries.

Figure 4 displays the real output responses of Argentina, Bolivia, Brazil, Colombia, Peru, and Venezuela after each of the studied external disturbances. It clearly shows that the boost created by each of the three external shocks is heterogeneous. In order to confirm quantitatively these differences, we compare the percentage of forecast error variance. Table 8 reports the percentage of forecast error variance explained by each external disturbance as an average of the significant responses 16 periods after the shock.

Panel I in Table 8 is the quantitative counterpart of Figure 4. On average, UNASUR economies seem to be more vulnerable to trade -16.6% of real output is explained by the external disturbance- than to monetary and financial shocks (10.54% and 10.05%, respectively). This result is unsurprising considering that they are mainly commodity producers. However, what is striking is that the external financial environment ranks as least harmful. After a century of financial crises in these South American economies, this evidence is positive for the region. Nevertheless, it is worth noting that the low degree of financial integration in most countries, Venezuela and Argentina being the most extreme cases, has influenced this result. Such a strategy is unsustainable if an economic integration project is envisaged.[22]

[22] Integration theory (Balassa, 1961) characterizes financial integration as a close complement to economic integration. Moreover, the optimal currency area criteria -related to the fourth phase of economic integration- highlight the importance of financial integration as part of the convergence process (Ingram, 1962; McKinnon, 2001). More recently, financial integration has proven to increase growth (Larrain, 2011) and welfare (Lee and Shin, 2012).

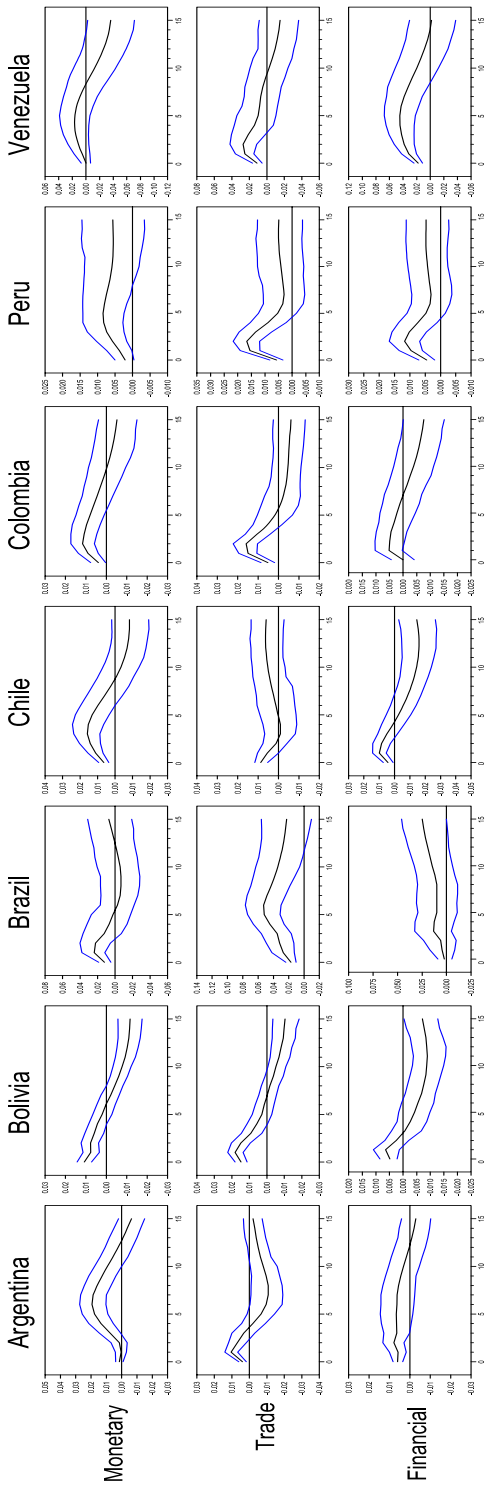

Figure 4. Real Output Responses to Three External Disturbances

Table 8. Relative Contribution of the Three Studied External Shocks

Shock		*AR*	*BO*	*BR*	*CH*	*CO*	*PE*	*VE*	*Average*
Panel I. Real Output									
(*y*)	Monetary	13.38	15.56	5.26	14.22	9.05	6.30	10.02	10.54
	Trade	7.62	29.49	17.70	14.70	14.25	25.30	7.10	16.60
	Financial	7.05	10.22	6.46	11.35	5.01	11.79	18.52	10.05
Panel II. Overall Average									
	Monetary	14.80	18.64	5.59	11.28	12.27	8.969	11.17	
	Trade	6.29	27.42	19.01	9.07	12.54	17.87	9.35	
	Financial	5.75	9.79	8.09	11.93	8.57	11.98	10.33	

Notes: This table reports the correlation coefficients of the real output (*y*), real exchange rate (*rer*), nominal interest rate (*r*), aggregate money (*m*), public deficit-GDP ratio (*def*), and external public debt-GDP ratio (*debt*) in Argentina (*AR*), Bolivia (*BO*), Brazil (*BR*), Chile (*CH*), Colombia (*CO*), Peru (*PE*), and Venezuela (*VE*) explained by external monetary, trade, and financial shocks. The percentage is reported as an average of the significant responses 16 periods after the shocks.

Several interesting country-specific characteristics emerged from the comparative analysis when considering the country-level averages shown in Panel II of Table 8. Peru and Chile, the most financially integrated economies, are highly sensitive to external financial disruptions - 11.9% of their vulnerability is accounted for by financial shocks. However, Peru is even more vulnerable to international trade shocks, which explain 17.9% of its vulnerability. A possible explanation of this difference is the considerable magnitude of industry exports (see Table 3) and the high technological capacity attributed to the Chilean economy (Molina-Domene and Pietrobelli, 2012). Nevertheless, Brazil, the most industrialized economy, is also more vulnerable to trade shocks than to monetary and financial shocks - 19% of Brazil's vulnerability derives from trade disturbances compared with 6% and 8% associated with monetary and financial shocks, respectively. This finding highlights two interesting facts. First, even the least synchronized country of the group, namely Brazil, shares a common vulnerability with most of the studied UNASUR members. Second, although a plan for the improvement of the industrialization of South American exports (similar to that implemented in Latin America from the 1950s to the 1980s) would be unlikely to eliminate the group's vulnerability to external commercial conditions alone, its inclusion as part of the whole integration project of UNASUR would certainly increase the expectations of a reduction in vulnerability. Further research on the former would constitute a significant contribution to South American integration. The strategic feature of the commercial aspect is also highlighted by the Venezuelan case. Despite its high dependence on revenue generated from primary exports, Venezuela is less affected by trade shocks compared with monetary and financial shocks. On average, only 9.35% of Venezuela's vulnerability is explained by trade shocks in contrast to 11.17% and 10.33% for monetary and financial external disturbances, respectively (see Panel II in Table 8). It

seems as though the enormous Venezuelan oil resources reduce the country's vulnerability to the external commercial environment instead of increasing it. This phenomenon is not obvious considering the high volatility of the oil market; however, the considerable market power of Venezuela may mitigate the uncertainty in oil prices (Reynolds and Pippenger, 2010). This case of natural resources diminishing vulnerabilities instead of increasing them is, however, rare in UNASUR. Therefore, turning natural resources into an advantage is undoubtedly another sizeable challenge for this integration project.

A final case to note is the Argentinean one. Argentina is the only economy that is more sensitive to monetary compared with trade and financial shocks (14.8% versus approximately 6%, respectively). Argentina's pegged exchange rate regime and the lack of confidence its citizens have in the national currency explain this phenomenon. In fact, 10 years after the 2001 crisis, demand for foreign currency had still not decreased, an effect amplified by the high inflation levels of recent years, forcing the authorities to impose strict trade barriers.[23] The fact that the monetary aspect is highly sensitive for Argentina is certainly a pro-monetary integration aspect. Achieving the fourth stage of economic integration, a monetary union, will thus be strategically important.

In general, the presented findings indicate that despite the fact that of all UNASUR members show different weaknesses, they have mutual sources of vulnerability against which they must fight. Therefore, all these countries would most likely benefit from greater integration by reducing their individual vulnerabilities. This finding suggests that decreasing vulnerabilities as a way to lessen economic dependence could be an advantage of economic integration, which should be considered by future theoretical research.

6. CONCLUSION

This study examined the reactions of UNASUR economies to external shocks, with the presented results allowing us to draw three main conclusions. First, the studied UNASUR members are highly vulnerable to the external economic environment. Even the most closed (Argentina and Venezuela) and most industrialized economies (Brazil) are considerably influenced by external disturbances. Therefore, vulnerability is a common concern to group members. Second, convergent short-run paths are present within UNASUR's key macroeconomic variables. The unconditional correlation analysis suggests a higher synchronization degree among the studied countries after the inception of UNASUR, while the conditional correlation analysis confirms the high

[23] See Frenkel and Rapetti (2010) for details about Argentina's exchange rate policy after the convertibility collapse. See also the CEPAL Work Document (2007) for an evaluation of Argentina's economic state after the 2001 crisis.

level of common reactions to external disturbances within the group. By considering the multiple specificities of the analyzed countries (e.g., exchange rate regimes, policy objectives, financial and commercial integration degrees, industrialization levels) as well as the embryonic stage of UNASUR, our finding of considerable synchronization shows the enormous potential for greater integration in the future. Finally, on average, domestic economies are more vulnerable to external trade disturbances than to monetary and financial disturbances.

Although Brazil is the least synchronized economy, it seems to be most vulnerable to the external trade environment compared with its UNASUR counterparts. In other words, even the country that could be categorized as less interested in committing to a South American integration plan stands to gain from such a strategy because of its shared vulnerabilities with its partner countries. Therefore, the fight against external vulnerabilities is a matter of common concern for all UNASUR members.

The evidence presented herein opens the door for further research on the South American regional integration strategy. UNASUR is an interesting project that has thus far been barely investigated from an economic standpoint. In particular, two extensions are proposed. First, a long-run analysis of convergence in the region, by adopting a vector error correction approach, for instance, would complement the short-run conclusions presented in this study. Second, theoretical models could be used to simulate how implementing regional measures, such as the adoption of a common South American currency or a regional fiscal management/authority, might affect the convergence degree of UNASUR countries.

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